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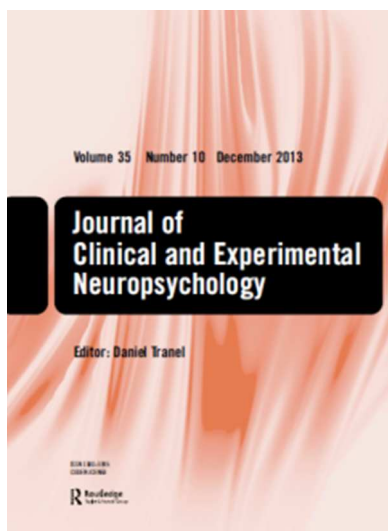
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Risk Taking and the Triarchic Model of Psychopathy.

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Running head: BART AND PSYCHOPATHY

Risk Taking and the Triarchic Model of Psychopathy.

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Running head: BART AND PSYCHOPATHY

Abstract

Introduction: High risk behaviors, such as aggression, criminality, sexual promiscuity, drug use, and gambling are often associated with psychopathic traits. Such behaviors might arise due to a lack of fear of the consequences (boldness) or due to impulsive actions (disinhibition). We examined risk-taking behavior in the laboratory setting using the Balloon Analogue Risk Task (BART), where an individual can inflate a balloon to earn a reward, but will lose this accumulated reward if the balloon bursts. The task reflects the willingness to take risks under conditions where the risk-taking behavior is understood and is made clear to the individual.

Methods: BART performance was measured in a mixed community and offender sample, and psychopathy was characterised via the Triarchic conceptualisation of psychopathy, which proposes that psychopathy is a combination of Boldness, Meanness and Disinhibition.

Results: Total psychopathy score was correlated with greater risk-taking on the BART, and this effect was mainly due to the Boldness scale rather than the Meanness or Disinhibition scales. These relationships were not moderated by the nature of the sample (offender vs community) or by gender.

Conclusions: Individuals with high psychopathy scores appear more willing to take risks on this simple laboratory task and this behavior appears due to boldness rather than being related to an impulsive disposition.

Keywords: Risk taking, BART, Psychopathy, Triarchic Model, TriPM

Running head: BART AND PSYCHOPATHY

Risk Taking and the Triarchic Model of Psychopathy.

Psychopathy is defined as a personality disorder characterized by a number of behavioral, emotional, and interpersonal traits (Cleckley, 1976; Hare, 1991a). Psychopathy has strong links to many behaviors that appear to be “high-risk”, such as criminal and antisocial behaviors (Gray et al., 2004; Hart, Kropp, & Hare, 1988), aggression and violence of many varieties (Hare, 1999; Porter, Woodworth, Earle, Drugge, & Boer, 2003; Woodworth & Porter, 2002), drug and alcohol abuse (Hemphill, Hart, & Hare, 1994; Sylvers, Landfield, & Lilienfeld, 2011), sexual promiscuity, sexual coercion (Fals-Stewart et al., 2003; Harris, Rice, Hilton, Lalumiere, & Quinsey, 2007), and problematic gambling (Blaszczynski, Steel, & McConaghy, 1997; Patrick, Hicks, Krueger, & Lang, 2005). Understanding the nature of psychopathic dysfunction, particularly as it relates to these high-risk behaviors, is an important goal for professionals involved in clinical and forensic services.

Several explanations as to why psychopathy is related to these high risk behaviors seem possible. First, psychopathy is often associated with an immunity to stress and fear. The taking of risks, by definition, involves the possibility of punishment/harm to self, or loss of reward. An insensitivity to punishment, or at least an indifference to it, (Hare, 1965; Lykken, 1957), may allow for greater risk taking. Second, a person might act without thinking about and/or not realising the consequences of their behavior (acting with disinhibition and in an impulsive manner). Again, psychopathy is often associated with raised impulsivity (Poythress & Hall, 2011; Snowden & Gray, 2011), and this may allow another route to risk-taking behaviors.

The Triarchic Model of Psychopathy

The concept of psychopathy continues to attract much research and controversy (Mokros et al., 2015). Recently, Patrick and colleagues (Patrick, 2010; Patrick, Fowles, & Krueger, 2009) have put forward a model where psychopathy consists of three distinct, but

Running head: BART AND PSYCHOPATHY

intersecting, phenotypic tendencies that they term boldness, meanness, and disinhibition. This model and measurement scale is referred to as the Triarchic Psychopathy Measure (TriPM).

The Boldness scale of the TriPM incorporates such concepts as dominance, self-assurance, social efficacy, and emotional resilience. Thus, some of these traits may be interpreted to be positive and perhaps to underpin successful enterprise. The boldness concept is highly correlated with that of “fearlessness” as conceptualised by another measurement scale for psychopathy, the Psychopathy Personality Inventory- Revised (PPI-R: Lilienfeld & Widows, 2005). However, the concept of “fearlessness” or “boldness” with regard to psychopathy is the subject of some controversy. Researchers have argued that the concept appears at odds with the view of the psychopath as a disordered individual with problems such as antisocial behavior or abuse of substances (Miller & Lynam, 2012). Others (e.g., Lilienfeld et al., 2012) have argued that the fearlessness concept is an important component of the psychopathic construct and is consistent with early descriptions of psychopathy (Cleckley, 1941), showing appropriate behavioral and physiological correlates. It is argued, therefore, to be an important piece of the psychopathy jigsaw (Venables, Hall, & Patrick, 2014). The TriPM scale would seem ideal to test the notion that risk-taking behavior might be strongly associated with an insensitivity to the fear of punishment (or at least the ability to act in the face of possible punishment).

The Meanness scale is, perhaps, what most lay-people might imagine psychopathic traits to be and includes callous attitudes, a lack of empathy and remorse, a lack of honesty, and a hostile and exploitative manner that includes destructive behaviour and physical aggression (Patrick, 2010; Patrick & Drislane, 2015). From the perspective of risk-taking behavior, it is also notable that the scale also incorporates excitement seeking (Patrick, 2010).

Running head: BART AND PSYCHOPATHY

The Disinhibition scale represents deficiencies in behavioral restraint, impulsivity, poor planning, a difficulty in controlling urges and emotions, and deficits in delayed gratification (Patrick, 2010). This scale would seem ideal to test the notion that risk-taking behavior might be strongly associated with a lack of planning or forethought or with an inability to withhold a potentially “harmful” response (Hall, Bernat, & Patrick, 2007).

The classical Psychopathy Checklist-Revised (PCL-R) model of psychopathy (Hare, 2003) has two Factors. Factor 1 describes interpersonal and affective characteristics and describes traits of grandiosity, callousness, shallow affect, and a lack of remorse or empathy towards others. Factor 2 describes lifestyle and behavioral characteristics including irresponsibility, poor planning and impulsivity, as well as antisocial and criminal acts. The PCL-R has more recently been described via a four-facet model (Neumann, Schmitt, Carter, Embley, & Hare, 2012) where the two factors have been further split into two facets each, termed Interpersonal, Affective, Lifestyle, and Antisocial.

The TriPM is strongly correlated with the clinician-rated PCL-R (Sellbom, Wygant, & Drislane, 2015; Venables, et al., 2014; Wall, Wygant, & Sellbom, 2015). However, an examination of the relationships between the sub-scales of the PCL-R (the four-facet model) and the sub-scales of the TriPM reveals that there is no simple one-to-one relationship. The Meanness scale appears to have positive relationships with all of the facets of the PCL-R, although these are stronger to Facet 3 (Lifestyle – impulsive, irresponsible and unfocused lifestyle) and Facet 4 (Antisocial – criminal and antisocial behaviors) than to Facet 1 (Interpersonal - grandiosity, superficiality and deceitfulness) and Facet 2 (Affective – callousness, poverty of emotion, lack of empathy or remorse). The Disinhibition scale shows consistent positive relationships with both Facets 3 and 4 (Lifestyle and Antisocial) of the PCL-R (Venables, et al., 2014; Wall, et al., 2015). The Boldness scale has been consistently

Running head: BART AND PSYCHOPATHY

found to have a significant ($r_s \approx 0.30$) relationship to Facet 1 (Interpersonal) of the PCL-R, but no consistent relationship to any other PCL-R facets.

The TriPM model differs from the PCL-R model in two major ways. First is the model's emphasis that the constructs described (meanness, disinhibition and boldness) are distinct constructs with independent aetiologies, rather than manifestations of a single underlying concept (psychopathic personality) as posited by the model underpinning the PCL-R. Second, it places a far greater emphasis on the notion of boldness, which Patrick et al. (2009) suggest is not well-represented in the PCL-R. However, Neumann, Hare, & Johansson (2013) argue that the concept of boldness is captured by the PCL-R, but does not load specifically onto one factor. Our research hypothesis centered on the notion that boldness might be a fundamental component underpinning risk-taking behavior. The TriPM was chosen because of this specific hypothesis and its emphasis on this trait.

The Balloon Analogue Risk Task (BART)

The Balloon Analogue Risk Task (BART; Lejuez et al., 2002), was designed to measure impulsive decision making (Reynolds, Ortengren, Richards, & de Wit, 2006). The task consists of a representation of a balloon on a computer screen. On each trial the participant has to decide whether to pump more air into the balloon and gain a reward for this, or to stop pumping and take the accrued reward. However, at some point the balloon will explode and the participant will lose all their attained reward if this happens. The participant is fully aware of the contingencies between the number of pumps and the increased possibility of an explosion – this is explained at the start of the task and does not have to be learnt. Risk-taking is measured by how many pumps of air the participant gives to the balloons and the number of explosions they cause.

The BART's validity has been demonstrated through strong correlations between the BART risk score and individuals' self-reported rate of addictive, reckless behavior, and

Running head: BART AND PSYCHOPATHY

health risk behaviors (Lejuez et al., 2002). The BART has demonstrated utility in differentiating delinquent from non-delinquent juvenile populations (Aklin, Lejuez, Zvolensky, Kahler, & Gwadz, 2005), drug users from non-drug users (Hopko et al., 2006), smokers from non-smokers (Lejuez et al., 2003), and adolescents with conduct disorder from healthy controls (Crowley, Raymond, Mikulich-Gilbertson, Thompson, & Lejuez, 2006). Hence, the BART has established itself as a valid laboratory-based measure of risk-taking behavior.

Two previous studies have investigated the use of the BART in relation to psychopathy, but with rather mixed results. In a forensic sample of male prison inmates, Swogger, Walsh, Lejuez, and Kosson (2010) characterised psychopathy using the PCL-R. They found risk-taking on the BART was not related to the total PCL-R score, or to either of its factors. Unfortunately, relationships with the facets of the PCL-R were not reported in this study. In comparison, Hunt, Hopko, Bare, Lejuez, and Robinson (2005) examined the relationship between BART and the Self-Report Psychopathy Scale (SRP-II; Hare, 1991b) in a sample of male and female undergraduate students. The SRP-II was designed to parallel the PCL-R model of psychopathy using self-report. Hunt et al (2005) found correlations between risk-taking on the BART and Factor 2 (“Antisocial Behavior”) of the SRP-II. These two studies offer conflicting findings regarding the relationship between the BART and psychopathy, although notably across two different samples. It is unclear whether this is due to different modes of measurement (self-report vs clinician rated psychopathy), or reflects real differences in the relationship between risk-taking and psychopathy in non-offender and offender samples. This requires further investigation.

Psychopathy and laboratory-based measures of risk taking.

Risk-taking in psychopathy has been explored using tasks other than the BART. In particular, the Iowa Gambling Task (IGT: Bechara, Damasio, Damasio, & Anderson, 1994)

Running head: BART AND PSYCHOPATHY

has been investigated on several occasions. In the IGT participants pick from four decks of cards that offer monetary rewards. For two of these decks the reward is “high” and for the other two it is “low”. However, on some cards there is also a “penalty” whereby money is removed. The frequency and magnitude of these penalties is arranged so that in the long term (after playing many cards) the high-reward decks produce overall losses, whereas the low-reward decks produce overall gains. Most participants learn to avoid these loss-producing decks even if they cannot verbalise the associated risks and why they avoid them (Bechara, Damasio, Tranel, & Damasio, 2005). A continued choosing of the high-risk decks can be seen as a measure of risk-taking behavior.

Several studies have claimed that psychopathy is associated with increased risk-taking scores on the IGT in both clinician-rated psychopathy and self-report measures (Beszterczey, Nestor, Shirai, & Harding, 2013; Dean et al., 2013; Mahmut, Homewood, & Stevenson, 2008; Morgan, Gray, & Snowden, 2011; van Honk, Hermans, Putman, Montagne, & Schutter, 2002). For example, Mitchell, Colledge, Leonard, and Blair (2002) report that a high PCL-R score is associated with a greater number of choices of the disadvantageous decks on the IGT (which is seen as a marker for greater risk-taking behavior or a failure to learn to avoid high risk situations) in participants with high psychopathic scores. However, the results are not consistently found and other studies report no such finding (Schmitt, 1999; Takahashi, Takagishi, Nishinaka, Makino, & Fukui, 2014). Still other investigations have found the opposite relationship (Hughes, Dolan, Trueblood, & Stout, 2015). Some of these studies have also considered which aspects of psychopathy might be related to risk-taking behavior on the IGT. Beszterczey et al. (2013) found that Factor 2 of the PCL-R was related to a greater number of risky choices, at least for the trials occurring later in the experiment, using a small sample of offenders. Dean et al. (2013) found that “secondary traits” (impulsive, volatile or self-destructive) but not “primary

Running head: BART AND PSYCHOPATHY

traits” (selfishness, lack of caring, callous attitudes) of psychopathy (as defined by the Levenson Self-Report Psychopathy Scale: Levenson, Kiehl, & Fitzpatrick, 1995) were related to IGT in a sample of college students. Morgan et al. (2011) found overall levels of psychopathy (PPI-R total score) to be related to IGT performance, but the associations to either of the subscales (fearless dominance or self-centered impulsivity) did not reach statistical significance. Thus, the overall picture of the relationship between psychopathy and risk-taking behavior is not clear. Once again, this confusion partly reflects the use of different models and conceptualisations of psychopathy (e.g., PCL-R, PPI-R), the use of self-report vs. clinician rated psychopathy, and the difference between offender and community samples. Overall, the most consistent evidence suggests that the lifestyle and antisocial components of psychopathy appear to be most strongly related to risk-taking behavior and to more adverse outcomes as measured by the IGT.

Extrapolation of results from the IGT to the BART is, however, problematic and performance on the two tasks does not always correlate (Upton, Bishara, Ahn, & Stout, 2011). The IGT requires the participant to learn about the decks through feedback from the rewards and penalties as the game progresses. Hence, failure to learn about the risks in the high reward/high penalty card deck, or a failure to learn from punishment, may account for the risky-decision making shown by people with high levels of psychopathic traits. This is in contrast to the BART task where the person is fully aware of the contingencies (i.e., the risk associated with another ‘pump’ of the balloon), but chooses to take this risk anyway. One could argue that the personality characteristics of these two types of “risk-takers” could be quite different. The BART measures a dimension between the cautious individual who ‘banks’ his rewards vs. the reckless gambler who ‘pushes for more’, but risks losing it all. In comparison, the IGT is a form of implicit learning task where the seemingly more advantageous choice is actually disadvantageous or risky and associated with greater loss or

Running head: BART AND PSYCHOPATHY

punishment. Therefore, we did not formulate our hypotheses of the relationship between the BART and psychopathy based on the results of the IGT as, in our opinion, these tasks (although superficially similar) actually involve different psychological processes and formulations.

Hypotheses.

While the TriPM appears to have a well-established nomological network and good construct validity (Patrick & Drislane, 2015), there is a dearth of evidence relating it to different types of behavioural, laboratory-based, task designed to measure the key psychological deficits underpinning psychopathy. Our main hypothesis was that total psychopathy scores would be positively related to BART scores. This was derived from the literature demonstrating that psychopathy is associated with a variety of risk-taking behaviors outside of the laboratory, that people scoring high on measures of psychopathy make impulsive decisions without thought for the consequences, and the hypothesis that psychopathy is associated with a lack of sensitivity to punishment (Lykken, 1957). The TriPM, with its separate scales for measuring boldness and disinhibition (as different measures of impulsivity) and meanness, allowed us to examine which of these constructs accounts for risk-taking behavior measured by the BART.

The Disinhibition scale of the TriPM is strongly related to self-report measures of impulsivity (Sellbom & Phillips, 2013). Hence, one might expect risk-taking behavior on the BART from an individual who shows high scores on the Disinhibition subscale. Further, Hunt et al. (2005) found a relationship between SRP-II factor two (antisocial behavior) and the BART. Hence, we hypothesised that the Disinhibition scale would be positively related to BART scores.

The Boldness scale of the TriPM describes a set of characteristics that are presumed to reflect individual differences in the brain's defensive mechanism (Patrick & Drislane, 2015).

Running head: BART AND PSYCHOPATHY

For example, the emotional modulation of the startle reflex when viewing emotional (threat) images has been shown to be deficient in psychopathy (Patrick, Bradley, & Lang, 1993), and in particular in those with high scores on Factor 1 of the PCL-R (Vaidyanathan, Hall, Patrick, & Bernat, 2011). Recently, the modulation of the startle reflex by threat stimuli has been examined with respect to the subscales of the TriPM. Esteller, Poy, and Molto (2016) found that the Boldness scale was uniquely associated with deficits in the modulation of the startle reflex. Hence, these individuals with high Boldness scores seem to show a deficit in producing a defensive reaction when faced with threat. We, therefore, predicted that the Boldness scale of the TriPM would be positively correlated with risk-taking behavior on the BART.

The Meanness scale of the TriPM described an individual with callous attitudes, a lack of empathy and remorse, and a hostile and exploitative manner. None of these personality traits would seem to be strongly related to the notion of risk-taking behavior. However, as mentioned previously, the Meanness scale also contains a component of excitement seeking. Sensation Seeking, as measured on the UPPS (Whiteside and Lynam, 1997), is similar conceptually to excitement seeking and has previously been found to be related to the BART (Sohn, Kang, Namkoong, & Kim, 2014). Given this, and that the concept of Meanness appears to be somewhat related to all psychopathic factors (see above), this might suggest that individuals scoring high on Meanness would also demonstrate a tendency to engage in risk-taking behaviors as measured on the BART.

Previous studies of risk-taking behavior and psychopathy using the BART differed in both the measures of psychopathy used (PCL-R vs SRP-II) and the nature of the sample (forensic vs community sample). We, therefore, collected data from both a forensic sample (offenders from a low security prison) and a community sample (undergraduate students)

Running head: BART AND PSYCHOPATHY

using the same measure of psychopathy (TriPM) and the same behavioral task (BART) across both samples.

Methods

Participants.

Offender Sample.

Participants were adult male offenders from a Category C closed prison in England (HMP Channing Wood). All offenders were approached to participate in the study, with the exception of the drug therapeutic community and the resettlement unit. These units are managed differently to the rest of the prison population and were purposefully excluded. Potential participants who were on open self-harm documents (therefore at an increased risk of harming themselves) were not included. This was to protect them from any additional psychological stress or difficulty and was explained to them as the reason for not being included in the experiments. Ethical approval was granted for this study by the Ministry of Justice National Offender Management Service (NOMS: ref 2014-096). NOMS policy dictates that no reward may be offered as incentive to take part in research using offenders so the rewards used were virtual.

Intelligence was assessed via the Wechsler Abbreviated Scale of Intelligence (WASI; (Wechsler, 1999) using the 2-item version of this instrument. Participants with an IQ lower than 70 were excluded from the study before statistical analysis (due to concerns that they may not have fully comprehended the task or the questions on the self-report questionnaire).

In total there were 80 adult male participants. Two participants were removed from further analysis due to IQ scores being less than 70. The mean age was 41 years (SD = 13.6, range 21-78) and average IQ was 100 (SD = 15.3, range 70 – 133). The majority of the participants identified themselves as being White British/English (87%). Five participants

Running head: BART AND PSYCHOPATHY

who completed the BART refused to complete the TriPM (which was presented later in the session), leaving a sample of 73 offenders with complete datasets.

Community Sample.

Eighty one participants (40 men, 41 women) were recruited from the undergraduate population at Cardiff University and were given course credit or payment for their participation. All community participants received either course credit or an equal amount of monetary reward regardless of their performance on the task. Ethical approval was granted for this study by Cardiff University (EC.14.05.13.3794). The mean age was 20.5 years (SD = 1.54, range 18 - 25). The mean age of males (M = 21.3) and females (M = 19.7) was not statistically different. All participants identified themselves as being White British.

Materials

Triarchic Psychopathy Measure.

The TriPM (Patrick, 2010) is a 58-item questionnaire that provides scores for each of three characteristics of psychopathy; Boldness (e.g. “I’m a born leader”), Meanness (e.g. “I don’t have much sympathy for people”) and Disinhibition (e.g. “I jump into things without thinking”). Items are answered via a 4-point scale: *true, somewhat true, somewhat false, and false*. The instrument has well established internal consistency in both community and forensic samples (e.g., Poy, Segarra, Esteller, Lopez, & Molto, 2014; Wall, et al., 2015). Internal consistency (Chronbach’s alpha) was good for all three scales of the TriPM in both samples (offender sample: Boldness = .79, Meanness = .89, Disinhibition = .90; community sample: Boldness = .75, Meanness = .81, Disinhibition = .83).

Balloon Analogue Risk Task.

The BART (Lejuez et al., 2002) attempts to measure risk-taking behavior in a real world context (i.e. the balance of loss versus reward). During the task the participant is presented with a balloon on the screen. They are told they can earn money by inflating the balloon (by

Running head: BART AND PSYCHOPATHY

pushing a button on the keyboard). Each “pump” will increase the size of the balloon incrementally (associated with a small reward for each pump), but at some point the balloon can explode and all monetary rewards for that balloon will be lost. Participants have the option to stop the task and take the reward at each trial, thus opting out before the balloon bursts. Virtual monetary rewards were presented on the computer screen within this study. The BART task was administered via software written in-house for this purpose.

Wallsten, Pleskac, and Lejuez (2005) found little change in participants’ behavior over trials, or in the amount of balloon pumps per trial after 30 balloons, and report that an argument can be made for choosing to present between 10 and 30 balloons (depending on constraints, such as testing time). In the current study 20 balloon trials were presented.

Participants were asked to inflate the balloon presented on the screen to earn money; each pump was worth five pence and accrued in a ‘temporary reserve’. Each click on the pump button inflated the balloon and was accompanied by an air inflation sound. The number of pumps on that trial was displayed on the screen. At any point during each balloon trial the participant could choose to stop pumping and press the “Collect” button, which transferred the money accrued in the temporary reserve to the permanent bank. The total earned was adjusted on the screen while a slot machine payoff sound was played. When a balloon was pumped past its individual explosion point the balloon on the screen burst, an explosive sound effect was generated from the computer, and all the money in the ‘temporary reserve’ was lost. The current trial ended once the balloon exploded or the money is collected, and a new balloon appeared for the next trial.

The explosion point for each balloon was randomly chosen from pump 1 to pump 16 for each of the 20 trials. The same sequence of explosion point on each trial was used for every participant. Hence, with increasing number of pumps, the likelihood that the balloon would burst would increase (from 1 in 16 on trial 1, to certain on trial 16) and the amount of

Running head: BART AND PSYCHOPATHY

reward participants lost would also increase. Participants were told that they could pump each balloon up to 16 times and that the balloon had been randomly pre-set to burst after a particular number of pumps. The task lasted from around 8 to 12 minutes, although no formal measure of total time taken was recorded.

The BART produced two measures of risk-taking behavior. These were the total number of balloon explosions across trials and the adjusted number of balloon pumps. The latter measure consisted of the average number of pumps across trials in which the balloon did not explode, discounting trials where participants were unable to continue pumping a balloon due to it exploding. The two measures taken from the BART were found to be highly associated, as expected ($r = 0.89$), see Table 2.

Procedure

Approval to conduct the research was granted by relevant organisational bodies (University ethical committee, the National Research Committee, NOMS and Prison Governors).

Offender sample.

Approaches were made to participants through leaflets canvassed under cell doors. Interested participants were given an information leaflet and consent form. They were given an opportunity to ask questions of the researcher and, if wishing to participate in the study, provided written informed consent. After test completion, participants were provided with an opportunity to discuss any questions and given a debrief sheet.

Community sample.

Participants were recruited through leaflets and notices on a noticeboard designed to recruit undergraduate students to psychological experiments. Once they had volunteered for the study participants attended the laboratory at a set time. After reading the information sheet they gave written consent to participate. The session included other tests not reported here.

Running head: BART AND PSYCHOPATHY

After test completion participants were provided with an opportunity to discuss any questions and given a debrief sheet.

Results

Data were inspected for outliers, but none were found. Q-Q plots and visual inspection of the data suggested that none of the data differed greatly from a normal distribution and so parametric statistical analyses were used.

Table 1 illustrates the mean scores for all the variables. The male community sample showed the greatest overall psychopathy scores on the TriPM with significantly greater scores than the male offender sample and the female community sample. This was reflected in both the Boldness and Meanness scales, but no significant differences emerged for the Disinhibition scale. Likewise, the male community sample showed the greatest risk-taking behavior on the BART, with significantly greater scores than both the male offender and female community sample.

Given that our community sample had a different age profile to that of the offender sample, we first examined for any age-related effects upon the measures of psychopathy and risk-taking in each of the samples separately. No associations with age reached statistical significance ($r_s < .20$, $p_s > .20$) save that age was negatively associated with TriPM disinhibition score ($r = -.31$, $p = .008$) in the offender sample.

TriPM and BART scores

The zero-order correlations between the three TriPM scales and the BART measures are shown in Table 2.

The Boldness subscale was significantly correlated with both measures of BART risk-taking behavior (bursts: $r = .35$, $p < .001$; adjusted pumps: $r = .30$, $p < .001$) with “medium” effect sizes (Cohen, 1992). The Meanness subscale showed a small effect size and was only statistically significant for the “number of explosions” variable ($r = .23$, $p = .002$).

Running head: BART AND PSYCHOPATHY

Somewhat surprisingly, the correlations between both BART measures of risk-taking behavior and the Disinhibition scale were insignificant and near zero.

We also calculated zero-order correlations for each group separately. The pattern of results was consistent across all three samples, with TriPM Boldness producing the highest correlations (male offenders: $r = .21, p = .04$; female community: $r = .23, p = .08$; male community: $r = .38, p = .007$) and no evidence for an association between TriPM Disinhibition and BART scores (all $r_s < |.08|, p_s > .24$). TriPM Meanness showed a significant positive association to BART score for the male community sample ($r = .28, p = .04$), but was not significant in the other samples.

All three scales, Boldness, Meanness and Disinhibition, were entered into a regression model simultaneously and we calculated both beta and the partial correlations in order to examine the overall and unique contribution of each scale. The model was significant ($R^2 = .14, F(3, 150) = 7.82, p < .001$). As shown in Table 3, only the Boldness scale was a significant predictor of number of BART explosions. The same pattern of results was produced with adjusted pumps as the dependent variable. Given that we had found some relationship between age and TriPM Disinhibition score for the offender sample, we also repeated these analyses entering age at Step 1 in the regressions. This produced only negligible changes to the pattern of results.

It was noticeable that the Meanness scale was significantly associated with BART explosions for the zero-order correlations, but not for the full model. This is suggestive that the variance it shared with either the Boldness or the Disinhibition scale was accounting for the zero-order correlation. To test this we examined if Meanness was predictive after the variance of each of these other scales alone had been accounted for. We entered Disinhibition at Step 1 of a regression model and then Meanness at Step 2. In this model, Meanness improved the model fit ($\Delta R^2 = .07, p = .001$) and significantly contributed to the

Running head: BART AND PSYCHOPATHY

model ($\beta = .30, p = .001$). When Boldness was used at Step 1, Meanness failed to improve the model fit ($\Delta R^2 = .01, p = .15$) and did not significantly contribute to the model ($\beta = .12, p = .15$).

For completeness, we also ran further hierarchical regression models where group (offender vs. community), gender, or group and gender, were entered into the model first, the subscales of the TriPM entered second, and the appropriate interaction terms entered at the final stage. In all these analyses, Boldness remained a significant predictor of the number of BART explosions, while the other subscales were never significant predictors. No interaction terms were significantly associated with BART scores.

Discussion

We found a clear association between psychopathy (as indexed by the total score on the TriPM) and risk-taking behavior as indexed via the BART task. Examination of the subscales of the TriPM revealed that the Boldness scale had the highest zero-order correlation with BART performance, and regression showed that only this subscale was a significant predictor of BART performance. Crucially, we could find no evidence that the Disinhibition scale of the TriPM was related to risk-taking behaviors as indexed on the BART. Hence, our results show that it is the boldness/ fearlessness traits of psychopathy, rather than the impulsive/irresponsible traits, that are crucial to performance on this task of risk-taking behavior in the light of known risk.

Psychopathy and risk taking behavior

Our results appear to differ somewhat from previous experiments investigating the BART and psychopathy. Swogger et al. (2010) used the PCL-R in a sample ($N = 119$) of male offenders, but failed to find any significant effects of levels of psychopathy on the BART performance. Indeed, the non-significant correlations were nearly all negative suggesting the lack of significant positive association between risk-taking behavior and psychopathy was

Running head: BART AND PSYCHOPATHY

not merely due to a lack of statistical power. However, the same study did find that certain other measures correlated with BART score. For instance, they note that anxiety was negatively correlated with BART score, hence those high on anxiety measures were more cautious. This finding is intuitively meaningful. The concept of “low anxiety” is apparent in the description of the concept of the Boldness scale and has empirical support in that the Anxiety subscale of the Neuroticism scale of the Neuroticism-Extraversion-Openness Personality Inventory-Revised (NEO PI-R: Costa & McCrae, 1992) is negatively related to TriPM Boldness (but not to Meanness, and is positively correlated with Disinhibition). Therefore, the lack of a relationship between PCL-R defined psychopathy and BART may relate to the concept of Boldness not being strongly represented in the PCL-R, as discussed earlier. The findings of no relationship between PCL-R and BART are surprising given that psychopathic individuals appear to show many risk taking and reckless behaviors in real-life. It would be valuable, therefore, to have further tests of PCL-R and BART to establish the reliability and generalizability of this null result.

Hunt et al. (2005) used a non-forensic sample of both genders and measured psychopathy via the SRP-II. Like the present study, they also found that global levels of psychopathy were related to greater risk-taking behavior. Hunt et al. also examined the subscales on the SRP-II. They found that the subscale of Antisocial Behavior (Factor II of the SRP) was related to BART scores, but that the Emotional Detachment (Factor I) was not. At first glance, this result appears to be very different to the present findings given that Boldness is a more interpersonal-affective personality characteristic (and thus conceptually is more likely to be a Factor 1 personality trait as opposed to the lifestyle and anti-social behavior characteristics of Factor 2). However, some caution is needed. First, the psychometric properties of the SRP-II are not strong (Derefinko & Lynam, 2006), and, secondly, the relationship between the SRP and the TriPM is not well established. Drislane,

Running head: BART AND PSYCHOPATHY

Patrick, and Arsal (2014) have examined the relationship between a later version of the SRP (SRP-III) and the TriPM in an undergraduate sample. The results show that the total scores on each instrument are well-correlated ($r = .69$) but that the subscales show no obvious correspondence. Crucially, the Boldness scale showed only small correlations with any of the subscales of the SRP-III, including Facets 1 and 2 which together constitute Emotional Detachment (Factor 1). Indeed, the largest correlation for Boldness was with the Erratic Lifestyle (Facet 3) subscale which is part of Factor II (Antisocial Behavior). Hence, it appears that the two instruments (TriPM and SRP) produce subscales that measure quite different features of psychopathic personality. This may explain the different pattern of associations with BART performance for the two self-report psychopathy scales.

TriPM Boldness

We hypothesised that Boldness would be associated with risk-taking behavior. The concept of Boldness encompasses traits of being insensitive to punishment and danger, the ability to remain calm under pressure, and to recover quickly from stressors (which could be termed resilience). There is a large literature demonstrating that psychopathic individuals appear relatively immune to the effects of punishment (Gregory et al., 2015) and will continue their behaviors in the face of possible punishment. Examples include deficits in passive avoidance learning (Blair et al., 2004; Newman & Kosson, 1986; Thornquist & Zuckerman, 1995), perseveration of response (Newman, Patterson, & Kosson, 1987) and reduced electrodermal response to a forthcoming aversive event (Arnett, Howland, Smith, & Newman, 1993; Dindo & Fowles, 2011). Thus, the “punishment” of the explosions of the balloon on the BART, or the fear of this punishment, may not provide the same avoidance incentive for individuals with high levels of Boldness.

As discussed in the Introduction, the concept of Boldness as a component of the definition of psychopathy is controversial. However, some have argued that this concept

Running head: BART AND PSYCHOPATHY

may be a distinguishing feature of psychopathy from Antisocial Personality Disorder (ASPD) (Venables, et al., 2014). For example, Wall et al. (2015) attempted to predict psychopathy score as defined by the PCL-R from a combination of ASPD symptoms and the scales of the TriPM. They found that the Boldness scale accounted for incremental variance above the ASPD symptoms in predicting total PCL-R score (and for Factor 1 and Facet 1). Hence, it appears that the concept of Boldness is what may distinguish psychopathy from ASPD. Our finding that Boldness is also linked to risk-taking behavior on the BART serves to support the idea that the Boldness scale captures a concept that has meaning to the clinical presentation of psychopathy and which adds to the nomological network of the scale and to the TriPM in general. Indeed, one criticism of the notion of fearlessness/boldness being part of the concept of psychopathy is that “*it captures primarily adaptive functioning*” (Miller & Lynam 2012: p318). It is easy to see how being able to remain calm under pressure and the ability to recover quickly from stressors can be an adaptive and a positive personality trait under certain circumstances. However, it is also adaptive to be appropriately cautious and to respond to signals of danger or social sanction. The present results, demonstrating that the concept of Boldness captures the tendency to engage in risk-taking behavior on this simple laboratory task, may be an instance where functioning and behavior associated with Boldness may be far from adaptive.

Meanness

The concept of Meanness is characterised by callous attitudes, a lack of empathy and disdain for others, rebelliousness, excitement seeking, and a lack of remorse. In the present study we found that this scale was also related to BART performance such that increased Meanness score was associated with a greater number of balloons burst. However, this relationship was not maintained in the regression analysis and the features that are unique to the Meanness scale (as indexed via the semi-partial correlation) were not significantly related to BART

Running head: BART AND PSYCHOPATHY

explosions. On further analysis, we determined that its shared variance with the Boldness scale, and not the Disinhibition scale, accounted for the relationship with BART scores. This pattern of results might be accounted for by the hypothesis that Meanness contains some elements of Sensation Seeking which is thought to be related to BART score (Sohn, et al., 2014). However, Sensation Seeking is also strongly associated with Fearlessness on the PPI-R (Malterer, Lilienfeld, Neumann, & Newman, 2010) and Boldness on the TriPM (Weidacker, O'Farrell, Gray, Johnstone, & Snowden, submitted) and hence the Meanness scale's unique variance may not be related to risk-taking behavior as indexed by the BART.

Disinhibition

Perhaps the most surprising aspect of the present results was the failure to find any relationship between the Disinhibition scale and risk-taking behavior on the BART. The Disinhibition scale is thought to be strongly related to externalising behaviors and to impulsivity. It is also strongly related to antisocial behavior and antisocial personality disorder (Venables, et al., 2014; Wall, et al., 2015). However, the BART task appears not to be a task of "impulsivity" as defined by a failure to think or plan ahead before acting. Indeed, research has not found evidence for strong relationships between BART scores and self-reported impulsivity via the UPPS-P (Cyders et al., 2007; Lynam, Smith, Whiteside, & Cyders, 2006; Whiteside & Lynam, 2001) with only the Sensation Seeking scale (which, arguably, is not a measure of impulsivity) being a consistent, if moderate, predictor of BART scores. These results are similar to those reported by Sohn, et al. (2014) in a community sample in Korea, and are consistent with a recent meta-analysis examining the issue of sensation seeking (using scales other than the UPPS) and BART (Lauriola, Panno, Levin, & Lejuez, 2014). Hence, our results suggest a clear difference between the reckless and impulsive behaviors associated with the Disinhibition scale of the TriPM and

Running head: BART AND PSYCHOPATHY

externalising disorders, and the calculated risk-taking as exemplified by the BART, with its closer relationship to measures of boldness, fearlessness and sensation seeking.

Sample effects

Our data show the rather puzzling finding that our male community sample showed greater levels of psychopathic characteristics (at least for the Total, Boldness and Meanness scales) compared to the offenders. Previous studies have also noted that while forensic samples tend to show significantly greater PCL-R scores than community samples, this is sometimes not reflected in self-report measures (Copestake, Gray, & Snowden, 2011; Malterer, et al., 2010). Copestake et al. (2011) suggest that this may be due to the questions having quite different interpretations for the two samples. Thus questions about rule breaking may be interpreted as questions related to minor infringements of behavior in the community sample (e.g. traffic violations), but as only major violations of laws by the offender sample. If so, overall levels of psychopathy are not meaningfully compared between samples, although the instruments may be valid measures of level of psychopathy within each sample. In the present study we tested whether there were significant differences in the association between TriPM scales and BART scores for the two samples via regression analysis and failed to find any significant differences. This is suggestive that the relationship between these psychopathic personality constructs and risk-taking behavior is similar for both the samples. However, this is based on a null result and differences might emerge in more powerful research designs.

The results also show that the offender group produces lower scores on the BART task than did the male community sample. Clearly, this was against our expectations given that we presumed that the offender population would have performed at least one real-life risky behavior and that the BART hopes to captures elements of this real-world behavior. This result suggests caution in the interpretation of any single BART score as an absolute

Running head: BART AND PSYCHOPATHY

level of risk-taking. The two groups (offender vs community) differ in many ways, such as being in a prison, experience in completing psychological experiments, etc., that may serve to frame the BART task to have different meanings between the groups which could affect performance (Benjamin & Robbins, 2007). Further, we were not permitted to give reward to the offenders for their participation, while the community sample received course credit or a monetary reward (irrespective of BART performance) for participation. Again, the magnitude and frequency of reward can affect BART (Ferrey & Mishra, 2014) and one would assume that it is the psychological meaning of the reward, rather than its physical magnitude, that is the key factor. All these are likely to differ between offender (or incarcerated) groups and a community sample, especially when the community sample consists largely of psychology students at a University. Given these problems it is hard to interpret the finding of higher BART scores for the male community sample as necessarily being related to greater risk-taking in this population. However, within each of the populations we found a similar relationship between the BART score and psychopathy.

Gender effects

Gender was also associated with differences in TriPM scores with men scoring higher on all measures save for the Disinhibition scale. These results appear highly consistent with a previous study in an undergraduate sample (Estellet et al., 2016). Men also showed greater risk scores on the BART which is consistent with previous research (Lejuez et al., 2002; Lighthall, Mather and Gorlick, 2009).

There was some suggestion that the relationship between TriPM scores and BART may differ between men and women. For example, the correlation between TriPM Boldness and BART explosions was significant for the male community sample, but was at only a trend level ($p = .08$) for the female sample. However, regression analysis did not find any significant interaction of the relationship of the TriPM scores and gender on BART scores.

Running head: BART AND PSYCHOPATHY

Further work with a more powerful design will be needed to see if gender does moderate the relationship between psychopathy and risk-taking on the BART task.

Limitations

The present study used a self-report measure of psychopathy. The limitations of self-report for the measurement of psychopathy have been well-rehearsed (Lilienfeld & Fowler, 2006). However, this allowed us to take the same measure of psychopathy across the two samples. The samples are also limited in that the vast majority were Caucasian and from the UK. This was consistent across both the offender and community samples. We did, however, have within our sample a number of female participants. Although no differences in the relationship between BART and psychopathy due to gender were detected, this is an area that requires further exploration given the reported differences due to gender between psychopathy and some other experimental tasks (e.g., Vitale, Brinkley, Hiatt, & Newman, 2007; Vitale & Newman, 2001).

We also used a “non-standard” version of the BART where we reduced the average number of trials before the balloon burst in order to provide for a shorter testing session (which is needed in offender populations where motivation to participate is not high and there are problems with attention and tolerance of boredom).

Conclusions

We present strong evidence that psychopathy is related to risk-taking behavior as indexed by the BART. Crucially, this form of risk-taking behavior was related to features of boldness rather than those of disinhibition or meanness. The BART may provide a useful behavioral measure of the willingness of individuals to take known risks. Future studies may wish to explore if the effectiveness of intervention programmes and therapies designed to alleviate reckless or risk-taking behavior in offender populations may also be indexed by a behavioral task such as the BART.

Running head: BART AND PSYCHOPATHY

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Disclosure of Interests

The authors report no conflicts of interest

Running head: BART AND PSYCHOPATHY

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Running head: BART AND PSYCHOPATHY

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Running head: BART AND PSYCHOPATHY

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Running head: BART AND PSYCHOPATHY

Table 1. The mean scores and standard deviations (numbers in brackets) for the measures of psychopathy and BART risk-taking are presented for the total sample and for the sub-samples.

	Total	Male (offenders)	Male (community)	Female (community)
1. TriPM	63.0 (20.5)	63.4 (21.5) ^a	73.1 (14.9)	52.5 (18.5) ^{bb}
Total				
2. TriPM	30.6 (8.5)	29.1 (8.0) ^{aa}	36.8 (5.8)	26.7 (8.6) ^{bb}
Boldness				
3. TriPM	13.5 (8.9)	12.3 (9.4) ^a	18.2 (6.8)	11.0 (8.2) ^{bb}
Meanness				
4. TriPM	19.0 (11.0)	21.9 (12.8)	18.1 (8.1)	14.6 (8.2)
Disinhibition				
5. BART -	9.0 (3.2)	8.0 (3.4) ^{aa}	11.2 (2.7)	8.9 (2.3) ^{bb}
explosions				
6. BART -	7.3 (1.6)	6.7 (1.7) ^{aa}	8.3 (1.4)	7.3 (1.2) ^{bb}
pumps				

Male offenders differ from male community ^a = $p < .05$, ^{aa} $p < .01$

Male community differ from female community ^b = $p < .05$, ^{bb} $p < .01$

Running head: BART AND PSYCHOPATHY

Table 2. Zero-order Correlations between Measures of Psychopathy and the Balloon Analog Task (BART).

	1	2	3	4	5	6
1. TriPM Total	-					
2. TriPM Boldness	.56**	-				
3. TriPM Meanness	.85**	.37**	-			
4. TriPM Disinhibition	.74**	-.03	.50**	-		
5. BART - explosions	.25**	.35**	.23*	.01	-	
6. BART – adjusted pump	.17	.30**	.14	-.03	.89**	-

Note. * $p < .01$, ** $p < .001$

Running head: BART AND PSYCHOPATHY

Table 3. Multiple Regression Analyses Predicting BART Explosions From the Three TriPM Subscales.

	R^2	β	Part
Boldness	.14**	.29*	.26*
Meanness		.15	.12
Disinhibition		-.06	-.05

Note. * $p < .01$